

2009 Airborne Topographic Mapper (ATM)
and PARIS Radar Depth Sounder
Spring Greenland Surveys

Snapshot of Science Survey Plans
as of 19 March 2009

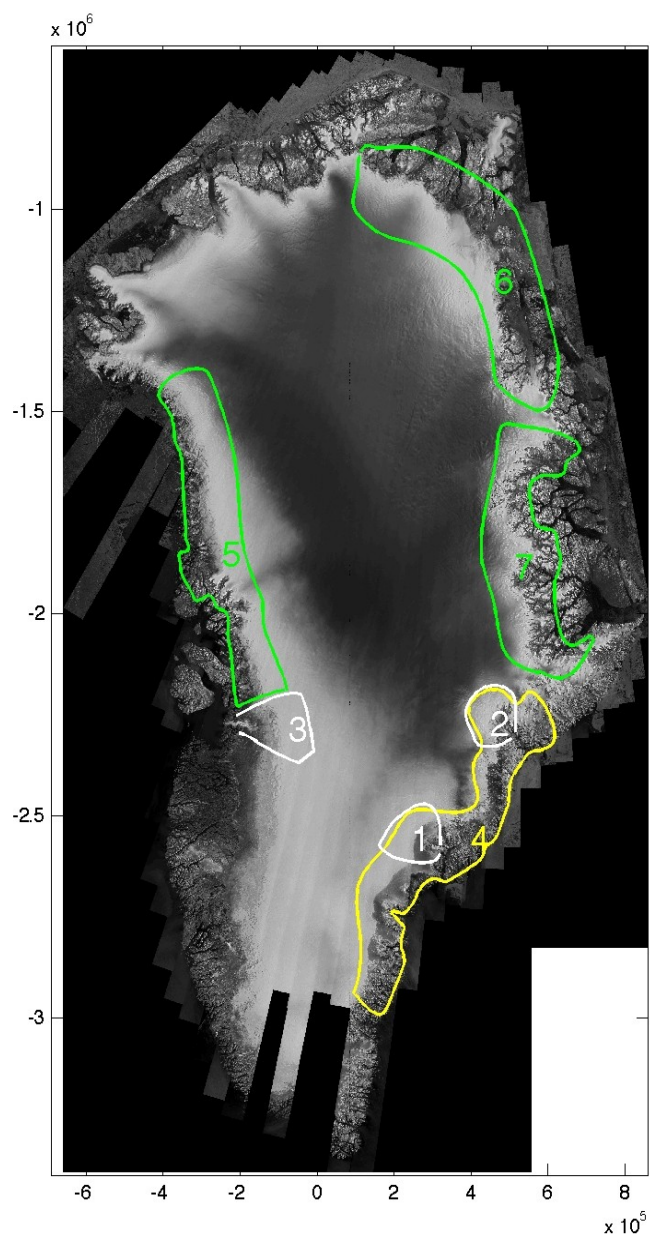
*Prepared by John Sonntag
of behalf of Bill Krabill
and the ATM and PARIS teams*

Preface

Flightline selection for Operation Ice-Bridge started with the following image from the Ice-Bridge document published in draft form in December. This image depicts a consensus of members of the cryospheric science community for the regions of highest interest, and the associated priorities for these regions. In most cases these regions coincide with sites that the PARCA project has focused on over the past few years, and already intended to survey in the 2009 field season. To further refine ICESat orbit segment selection for Ice-Bridge lines we are working with the ICESat project to identify which lines would most benefit from having an aircraft data set collected over them. This is still an activity in progress, although we have tentative flight line selection displayed in the following figures.

The specific R&A lines for this year are intended to address a combination of requests by various PARCA investigators [Eric Rignot, Ian Joughin & Ian Howat, and Mark Fahnestock], from internationals [Tavi Murry, Carl Boggild], and our own observations, both from recent ATM and ICESat data, and from recent papers and AGU and IGS presentations. To this point we have incorporated Eric Rignot's request for Petermann Glacier channel crossings, and Tavi Murry's request for Steensby Glacier data into a mission that also resurveys lines on the Humbolt Glacier, and Ryder Glacier [see attached figures.] We had already planned a resurvey of Daugward-Jensen [following up on a recommendation from Gordon Hamilton/U.ME at a recent PARCA meeting]. We have determined that we can easily add the extra flight lines requested by Tavi Murry in this same flight. For the western slope south of Thule we had already planned one R&A flight, and one Ice-Bridge flight. We believe we can accommodate most if not all of Ian Howat's requests into these two flights.

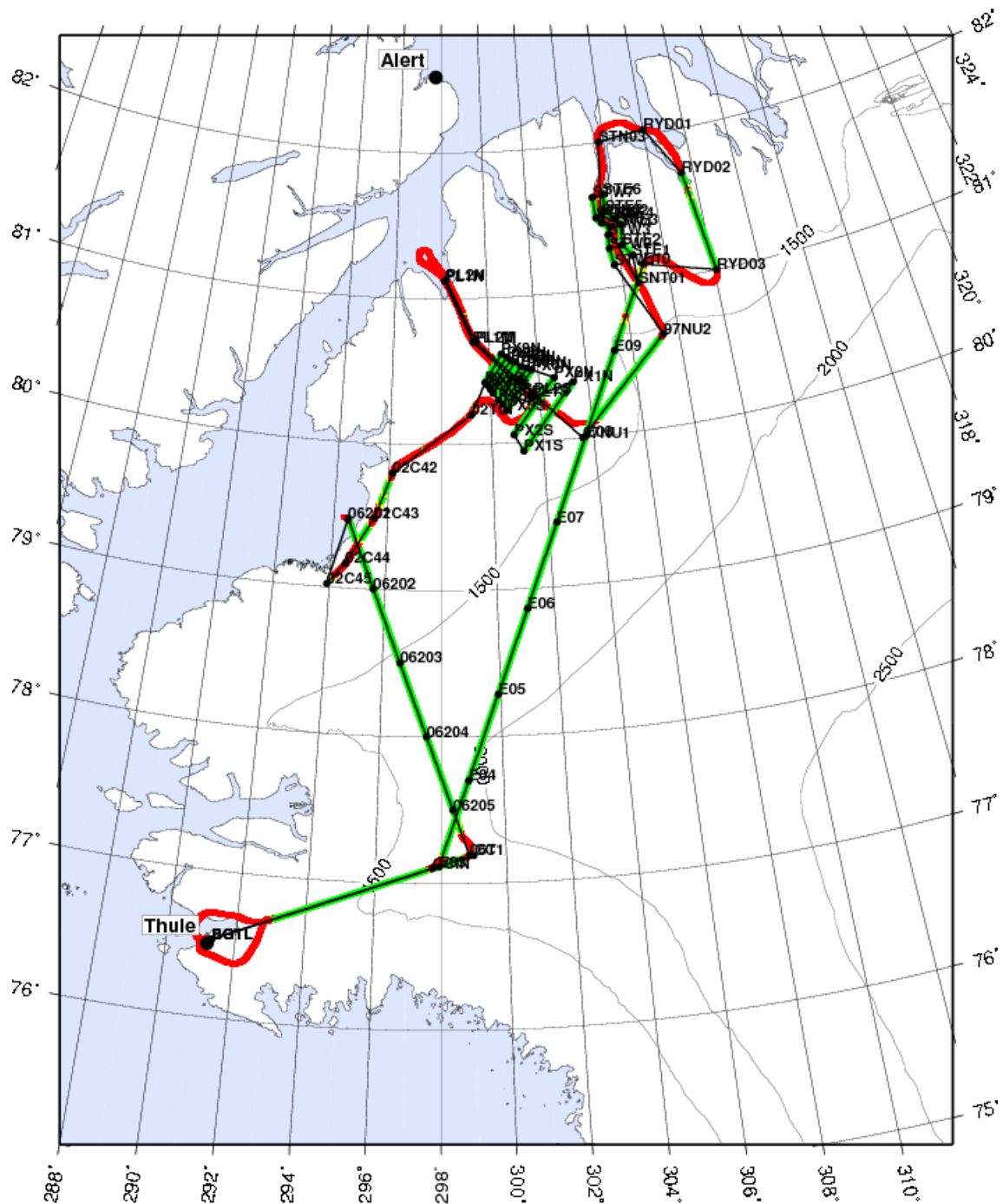
One question appropriate for the cryospheric community to debate is whether to resurvey the grid over Helheim Glacier, or to start a new grid survey over Kangerdlugssuaq Glacier. We started a new grid over Helheim [similar to the Jakobshavn grid that we started in 1997] in 2005. It has been repeated in each of the last 4 years, so it might make sense to skip it this year. It is an easy glacier to survey with a Twin Otter [as was done in 3 out of the last 4 years] because of the proximity to Kulusuk, whereas a grid over Kangerdlugssuaq cannot be accommodated within the range of an Otter, and must be done with the P3. However, Helheim came out as the number 1 priority in the community survey for the draft Ice-Bridge document.



This flight plan is considered complete; but we can add glacier lines in the immediate Thule vicinity (requested by Arendt/Fahnestock) if time is available at end of flight.

Thule 01

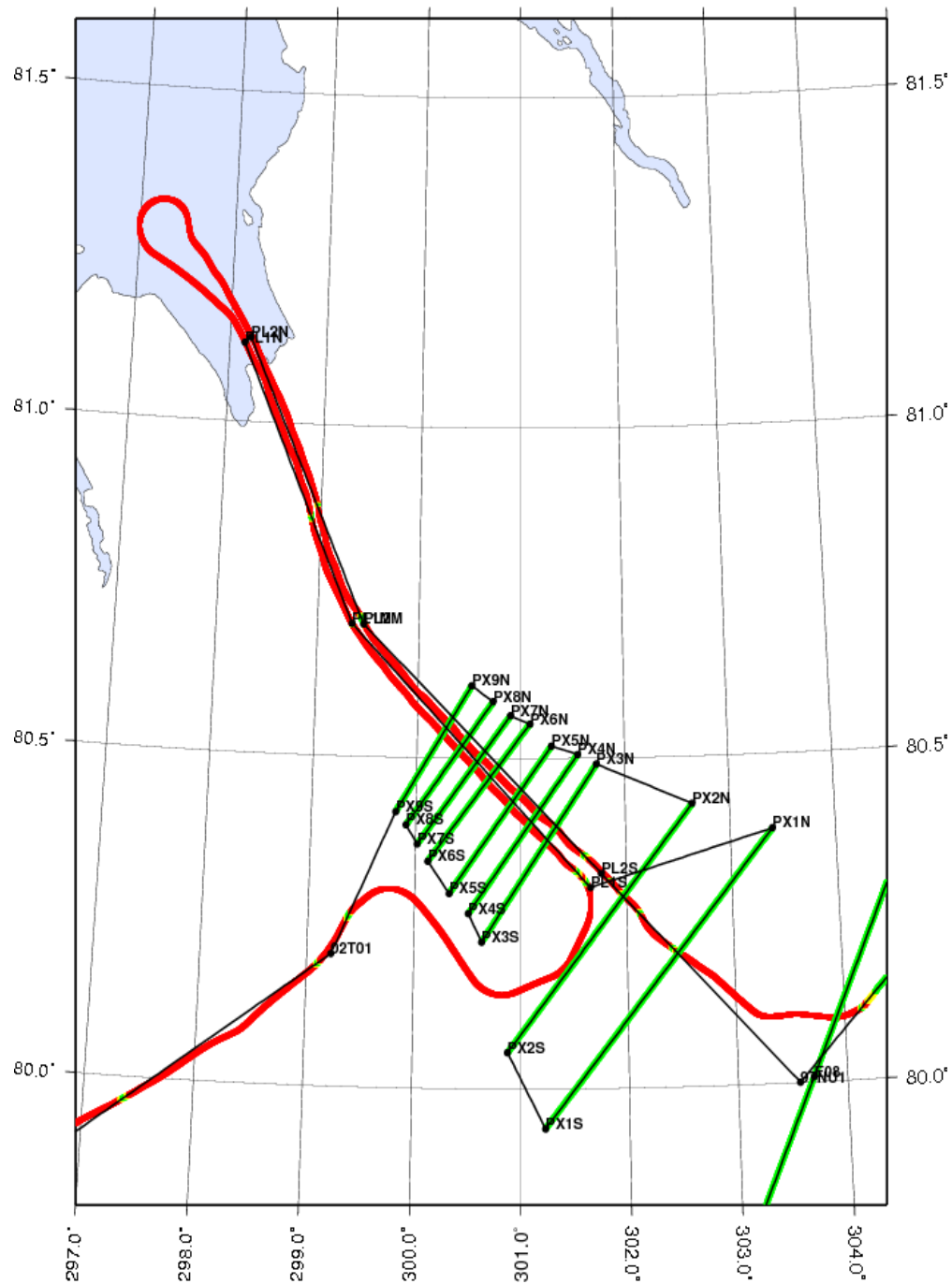
7.2 hrs at 250 knots groundspeed



Thule 01 Petermann detail
includes 9 crossing lines (requested by Rignot)

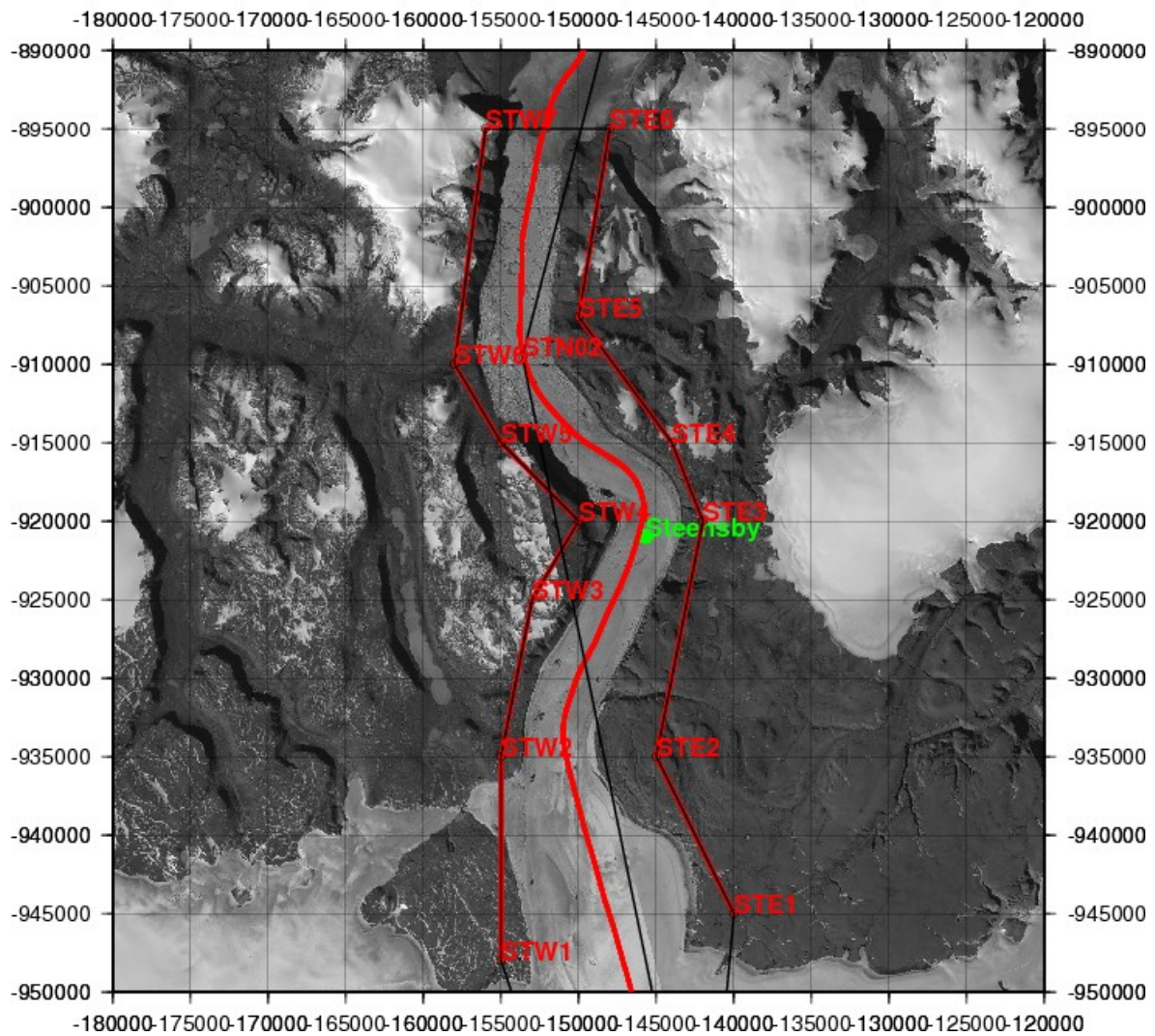
Thule 01

7.2 hrs at 250 knots groundspeed



Thule 01 Steensby detail
overflights of rocky sides requested by T Murray (Swansea)

Steensby



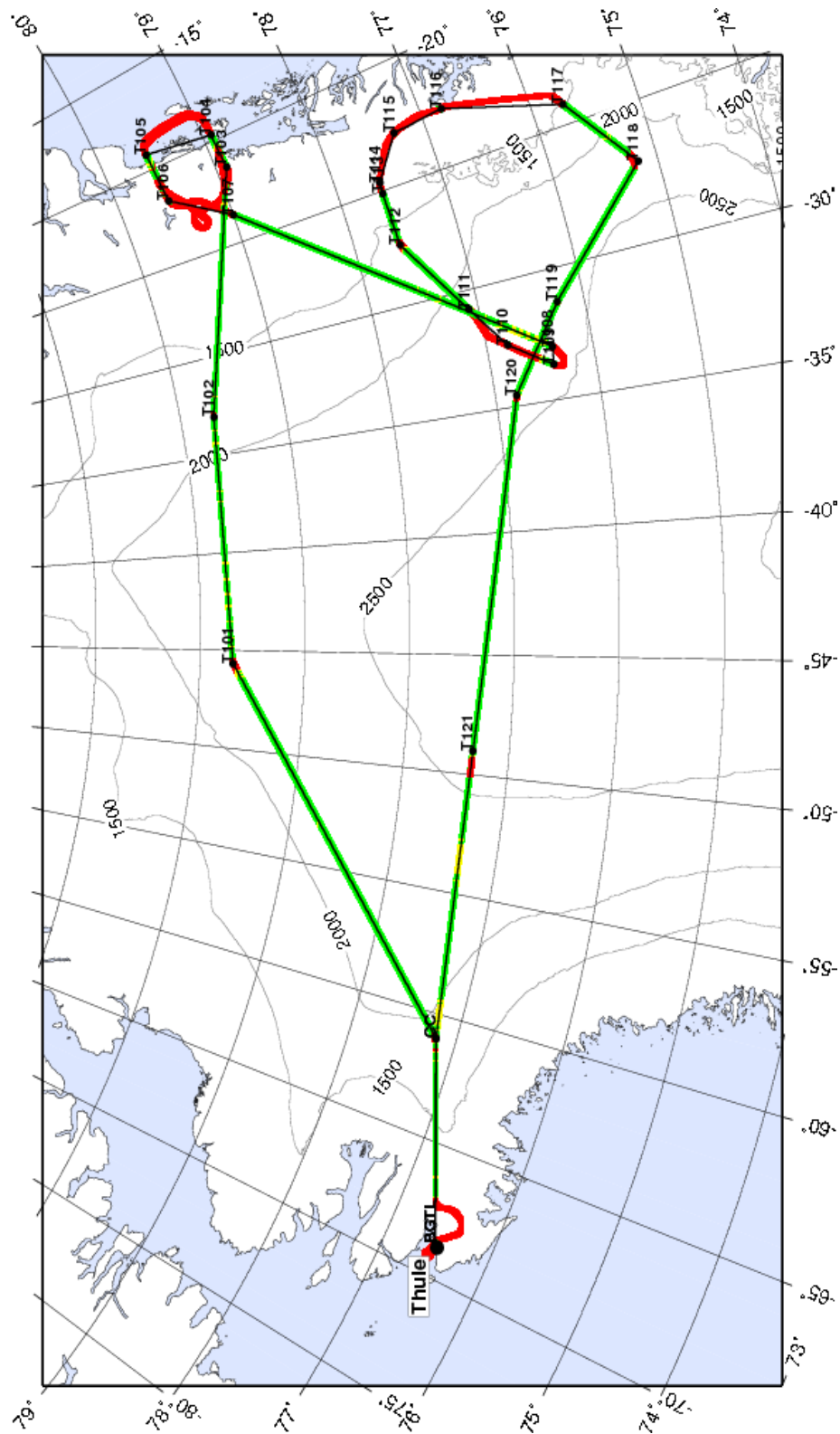
Mission Thule 02

R&A Krabill flight

This flight plan is considered complete; but we are considering replacing the Storstrommen/Bistrup lines with something further north (Academy Glacier perhaps? Nord icecap? More ICESat lines?)

Thule 02

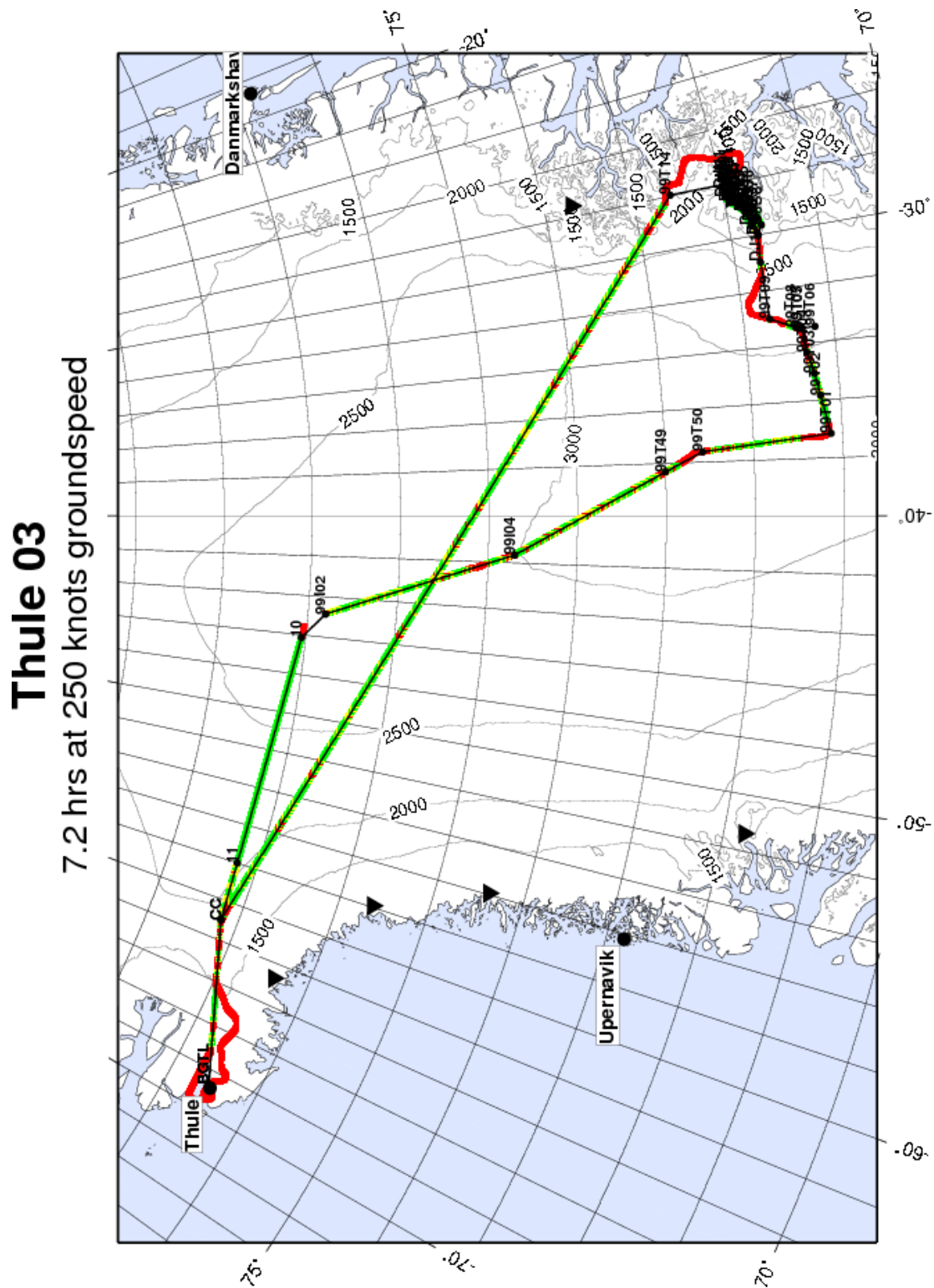
7.7 hrs at 250 knots groundspeed



Mission Thule 03

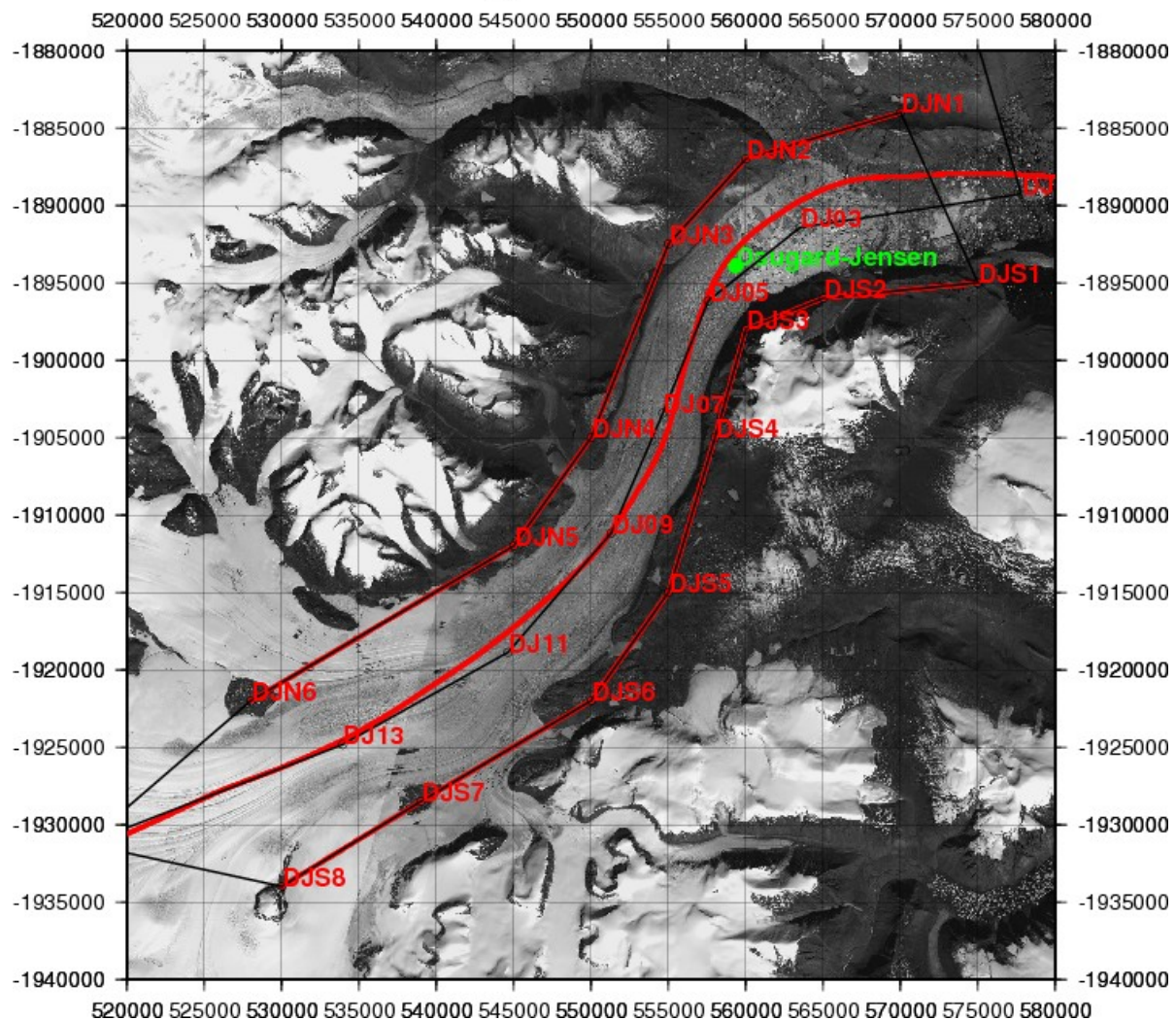
R&A Krabill flight

This flight plan is considered complete; but we can add glacier lines in the immediate Thule vicinity (requested by Arendt/Fahnestock) if time is available at end of flight.



Thule 03 Daugard-Jensen detail
overflights of rocky sides requested by T Murray (Swansea)

Daugard-Jensen



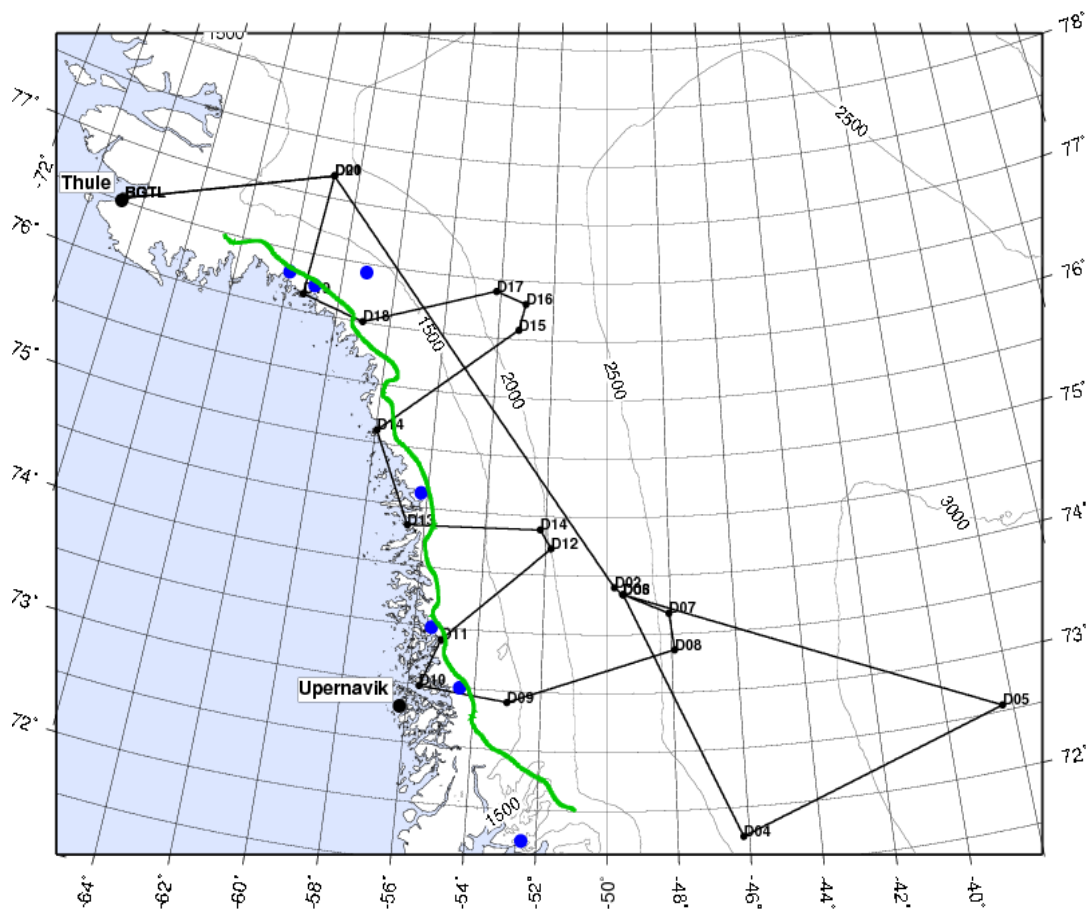
Mission Thule 04

R&A Krabill flight

This flight plan is a (very) rough draft at this time. Our intention is to fly the ATM legacy “coastal zigzag” line south of Thule (shown in black), return along the Rignot request line (shown in green), and divert to fly longitudinally along as many of the Howat request glaciers (blue dots) as practicable, as we follow the Rignot line. We'd like the glaciological community to note that our experience in flying surveys along this part of the Greenland coast has been one of dealing with notoriously poor weather. They should keep their expectations correspondingly low.

Thule 04

x.x hrs at 250 knots groundspeed

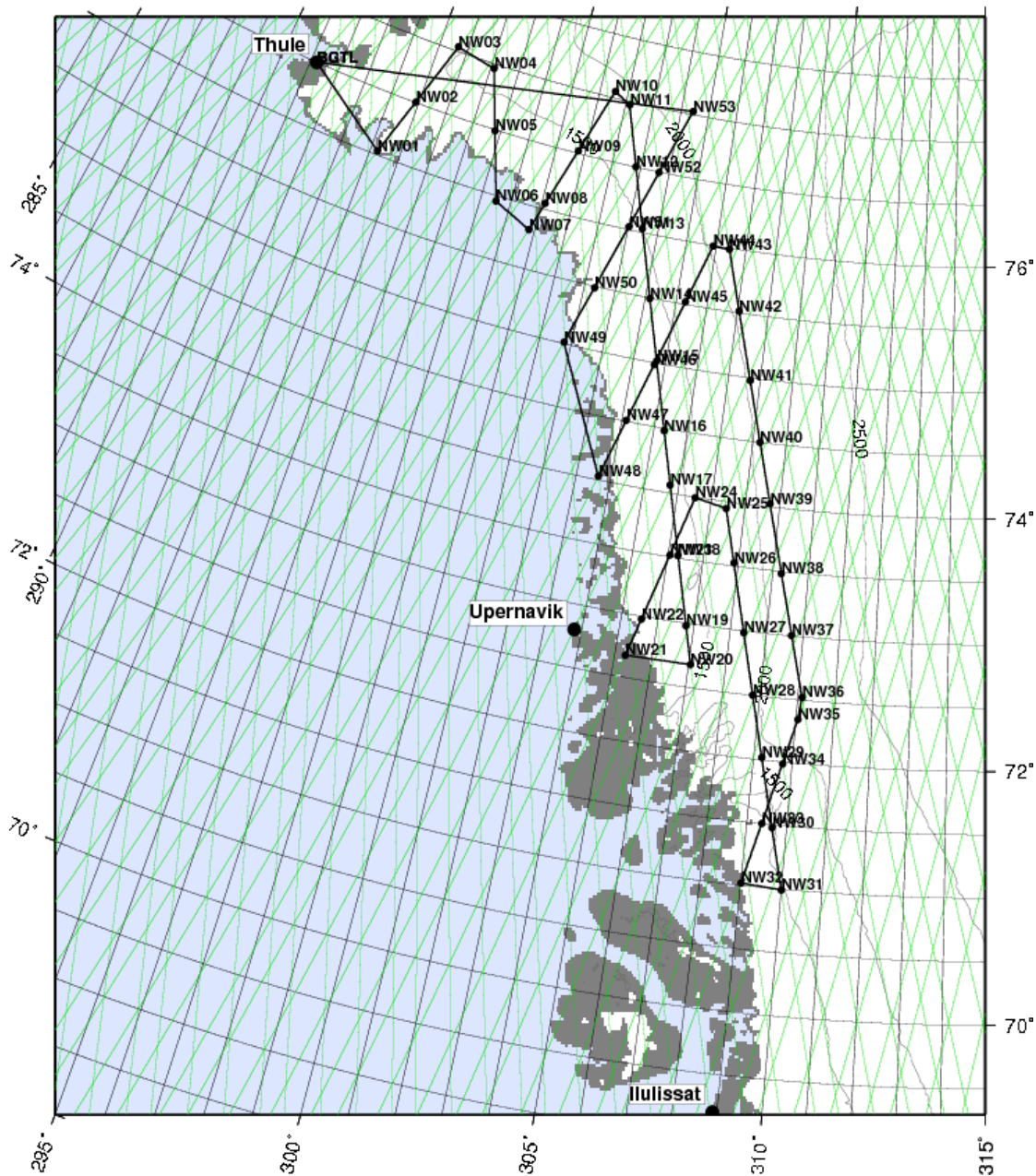


Northwest Gap-Filler Mission

This flight plan is in an intermediate stage of completion. We still need to (a) verify that good ICESat data exists along the ground tracks selected for the mission, and (b) investigate whether we can divert from some of the ground tracks to survey any of the requested Howat glaciers which we do not get during Mission Thule 04.

Northwest Gap-Filler Flight

x.x hours at 250 knots groundspeed

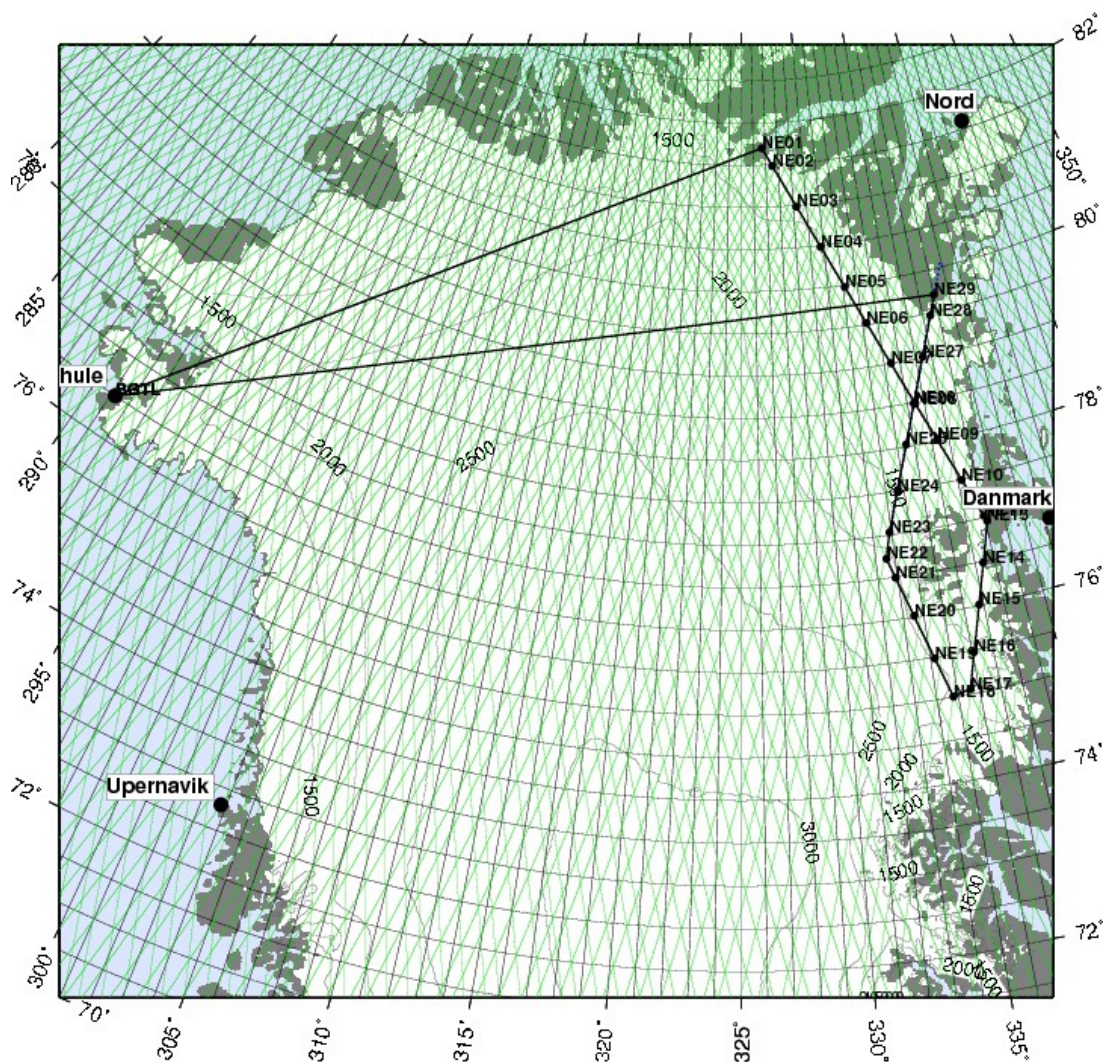


Northeast Gap-Filler Mission

This flight plan is mostly complete. We have verified the existence of good ICESat data along the selected ground tracks. We still need to make the long transits between Thule and the ground tracks productive by flying along legacy ATM lines.

Northeast Gap-Filler Flight

x.x hours at 250 knots groundspeed

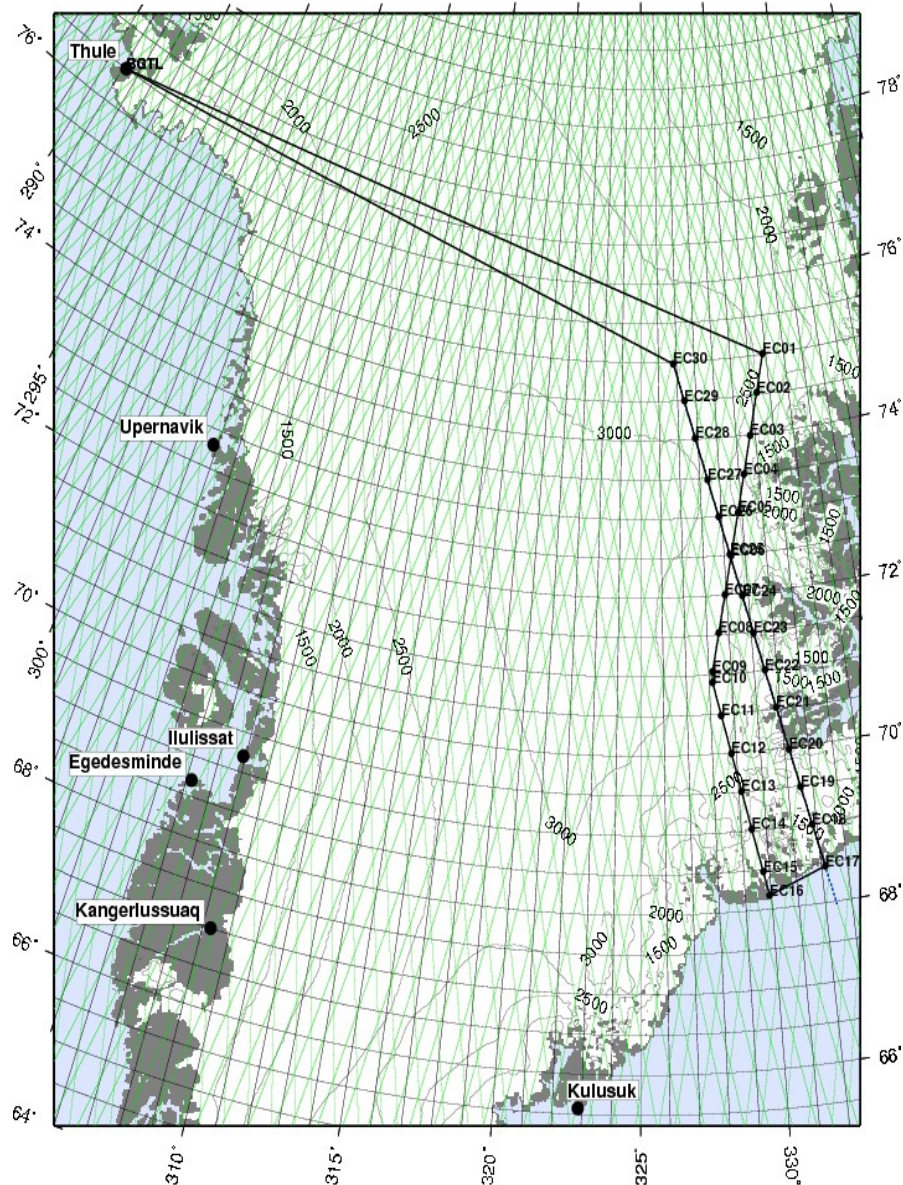


East-Central Gap-Filler Mission

This flight plan is mostly complete. We have verified the existence of good ICESat data along the selected ground tracks. We still need to make the long transits between Thule and the ground tracks productive by flying along legacy ATM lines. We note that this flight can be flown about as economically (in terms of flight time) from either Thule or Sondy (though fuel in Thule will be much cheaper). We intend to keep the option open to fly this mission from either base, depending on how the schedule works out.

East Central Gap-Filler Flight

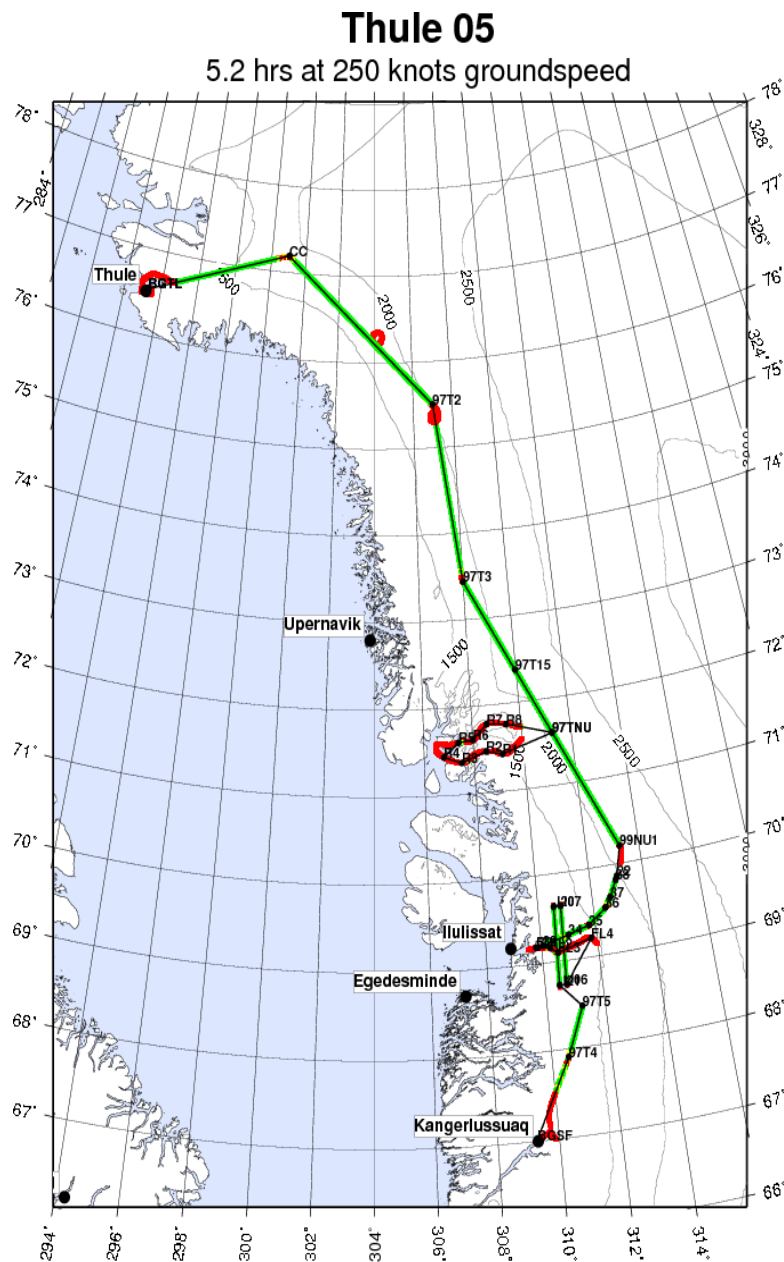
x.x hours at 250 knots groundspeed



Mission Thule 05

R&A Krabill flight

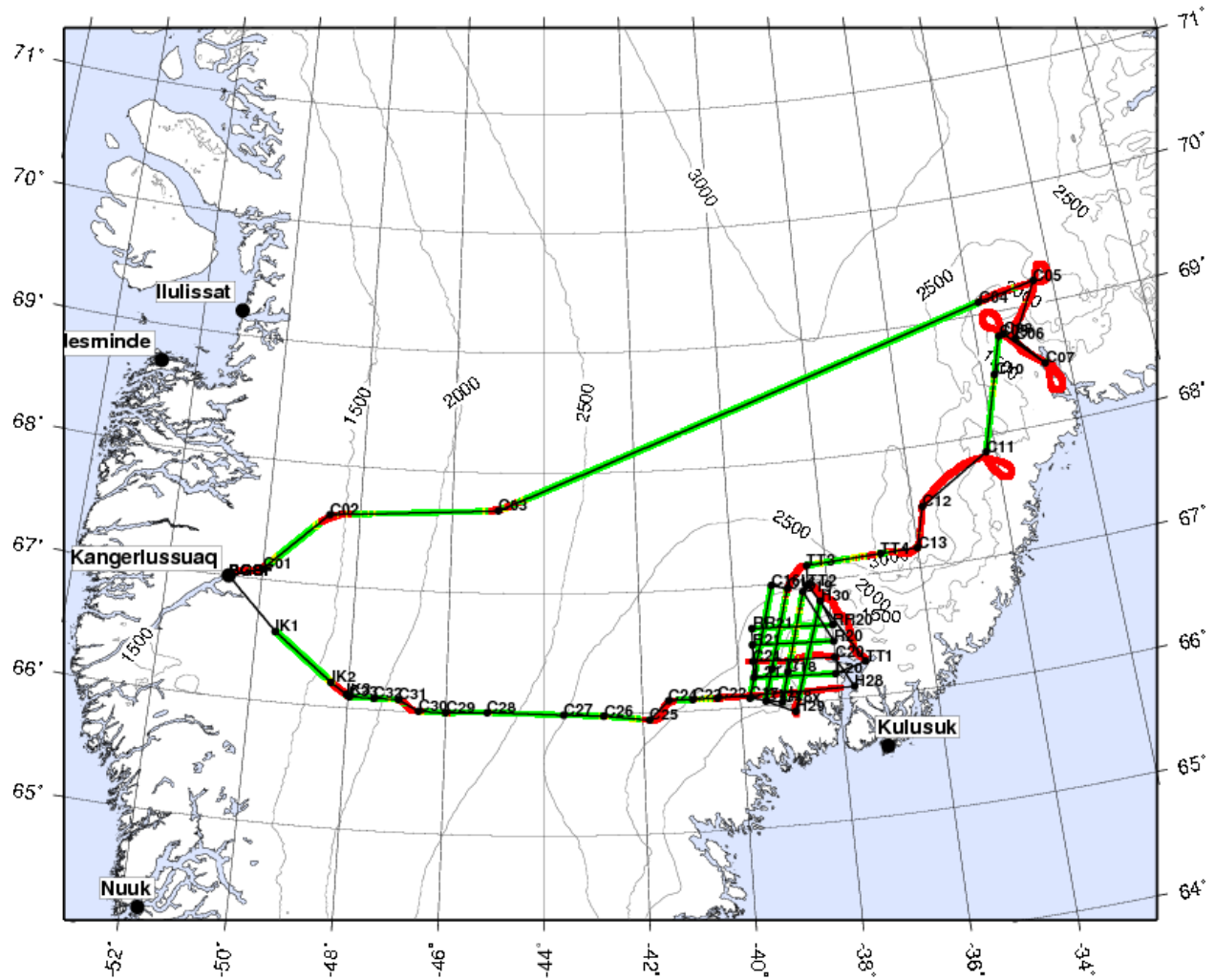
This flight plan is somewhat notional at this time. It is a transit and science flight which will reposition the project from Thule to Kangerlussuaq sometime late in April. We intend to survey as much as possible along the way, with longitudinal Rinks and Kangerdlugssup Glaciers surveys and some portion of the Jakobshavn grid as high priorities (Rinks is also a Howat request). If our Thule flights progress as planned, we do not currently have sufficient budget to fly more than 5 hours in this flight. But we consider the Jakobshavn grid a high priority, and would submit that a modest budget extension to allow us to flesh out a full 8-hour flight, to get as much of it as possible, would be a sound investment on the part of NASA Headquarters.



Mission SONDY 01
R&A Krabill flight
This flight plan is considered complete.

SONDY 01

7.8 hrs at 250 knots groundspeed



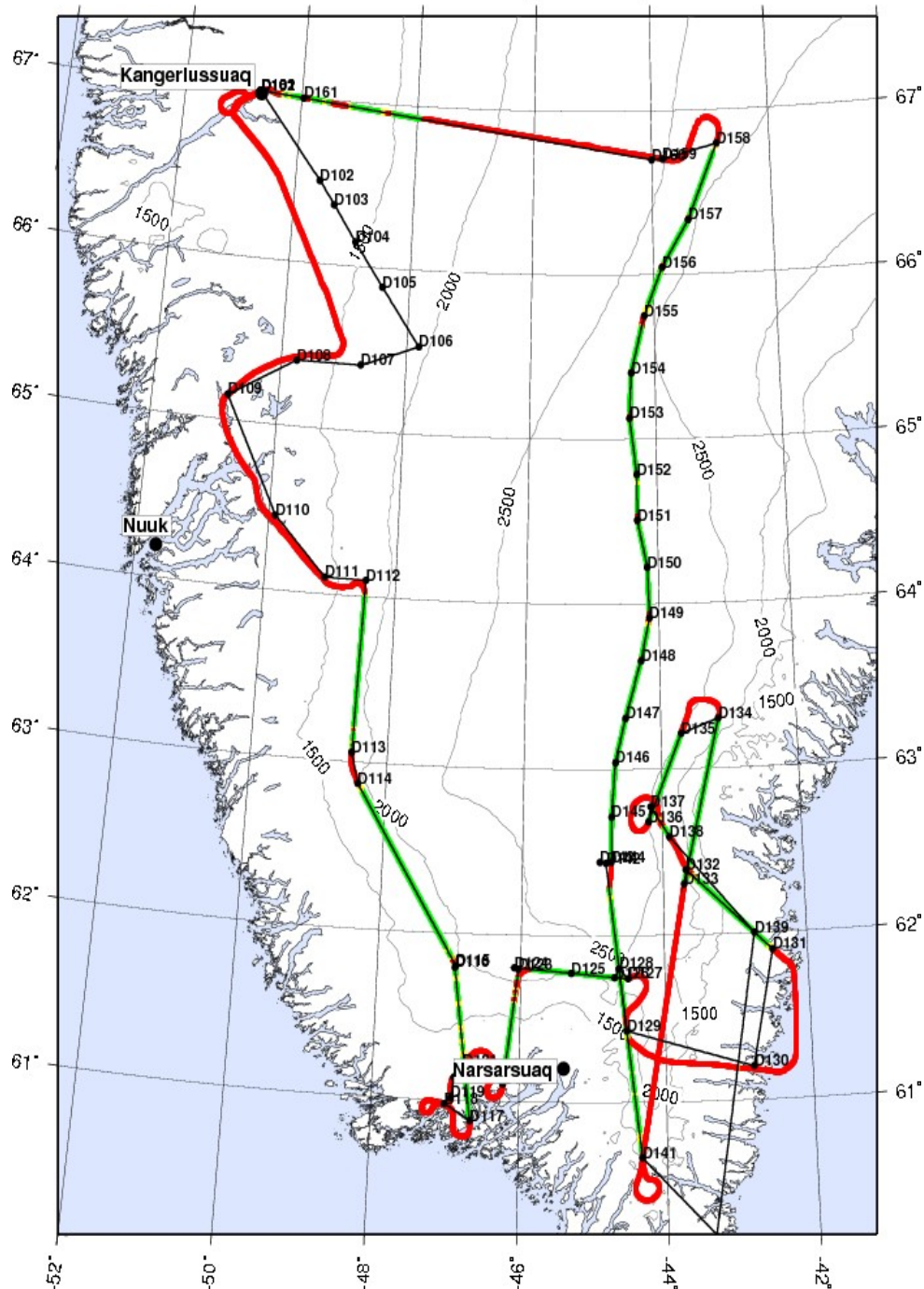
Mission SONDY 02

R&A Krabill flight

This flight plan is a rough draft at this time. We intend to concentrate on the southeast, flying longitudinally along glaciers we previously surveyed in 2008, as well as fly generally along at least one elevation contour (either along a descending ICESat track or along the ATM legacy “2000m traverse” line, with the aim of assessing the inland spread of observed coastal thinning. We also hope to survey Kangiata glacier in the southeast, which is a Howat request and which we last surveyed in 2008.

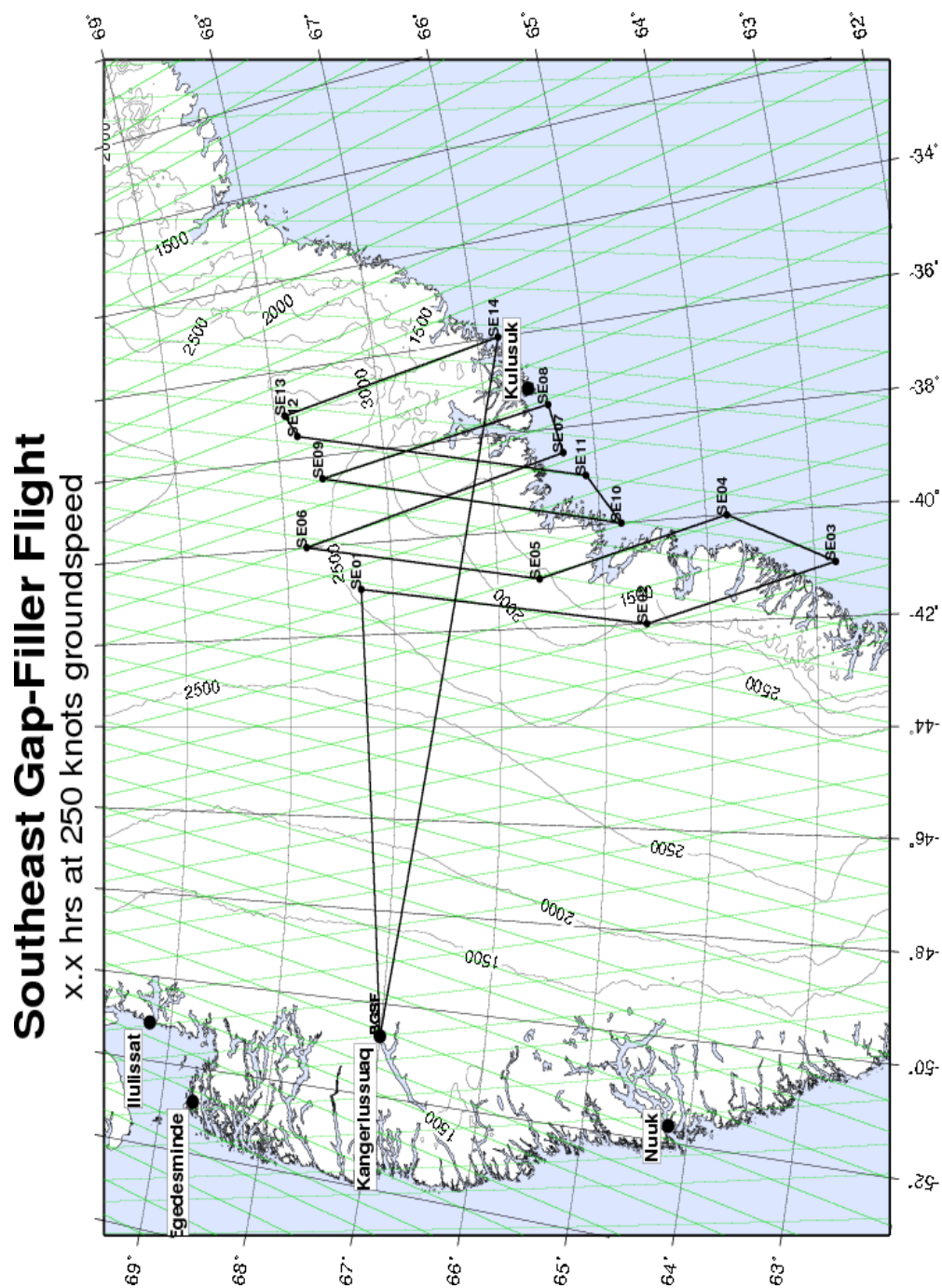
SONDY 02

x.x hrs at 250 knots groundspeed



Southeast Gap-Filler Mission

This plan is a rough draft at this time. We still need to (a) use actual ground tracks as mission waypoints, rather than the rough approximations shown below, and (b) verify that the selected tracks have good ICESat data. We should also investigate whether we can divert from the ICESat tracks in the area just east and north of the Sermilik (the large sound just west of Kulusuk) in order to survey areas there requested by Arendt/Fahnestock.



Kangerdlugssuaq and Jakobshavn Gap-Filler Mission

This plan is a very rough draft. Since it was prepared, further clarification of the gap-filler portion of the project budget revealed that this flight could be split into two full-flights, one concentrating in the Kangerdlugssuaq region and perhaps extended north towards the Geikie Plateau, and the other concentrating on ICESat lines over the Jakobshavn basin.

